Ministry
of
Transportation

Ontario

MI-121

HOT MIX JOINT COMPACTION IN 1987

MATERIALS INFORMATION

ENGINEERING MATERIALS OFFICE

HOT MIX JOINT COMPACTION IN 1987

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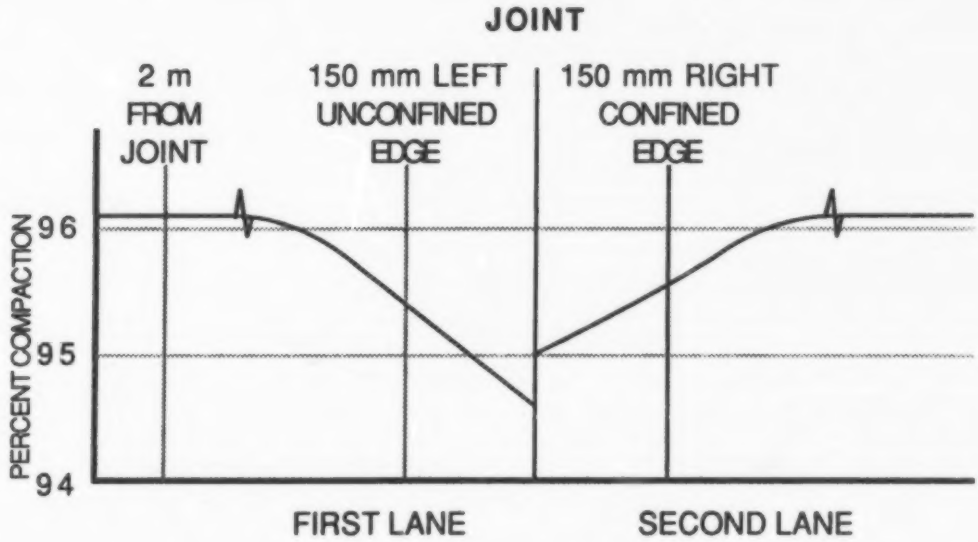
INTRODUCTION

In 1986, the Ministry of Transportation (Ontario) cored hot mix pavement to determine thickness and density in both main lane paving and 150 mm from the joint between adjacent lanes in the lane placed by the second paver, unless the pavers were working in echelon. If the lanes were paved in echelon, no cores were required at the joint. This work was reported in MI-111 "1986 Hot Mix Compaction Summary", May 1987.

It was found that compaction 150 mm from the joint in the second lane paved averaged 0.6% less than the 96.1% compaction achieved in the main lanes. It was expected that compaction near the joint in the second lane paved would exceed that near the joint in the first lane paved due to edge confinement. These expectations are illustrated in Fig. 1.

FIG. 1: EXPECTED COMPACTION AT LONGITUDINAL JOINT (HISTORICAL DATA)



To determine the compaction actually attained on each side of a longitudinal joint in 1987, sets of two cores were cut from the mat, one on each side, unless the pavers were working in echelon as defined in OPSS Form 310.03. Furthermore, the 1987 cores were cut with the edge of the core coincidental with the joint itself to determine if densities were lower at the edge than 150 mm away.

1987 Joint Compaction Data

Compaction results for 970 pairs of cores from all regions of the Province were entered into a micro-computer spread sheet for analysis. Table I summarizes the joint compaction data by Region. Figure 2 presents the Regional data in the form of histograms, showing the number of occurrences at each percent compaction. Table 2 presents the data by Region and mix type. The analysis shows that on average, the compaction on either side of the joint is equal and that it is lower by 0.5% from that obtained in 1986, 150 mm from the joint.

TABLE 1: REGIONAL SUMMARY OF JOINT COMPACTION

	1ST. LANE		2ND. LANE	
REGION	MEAN	ST. DEV.	MEAN	ST. DEV.
NORTHWESTERN	94.7	1.88	94.7	1.80
NORTHERN	96.1	1.71	95.6	1.56
EASTERN	95.4	1.57	95.1	1.54
CENTRAL	94.5	2.55	94.6	2.71
SOUTHWESTERN	94.9	2.77	94.6	2.63
ALL	95.1		94.9	

FIG. 2: JOINT COMPACTION HISTOGRAMS

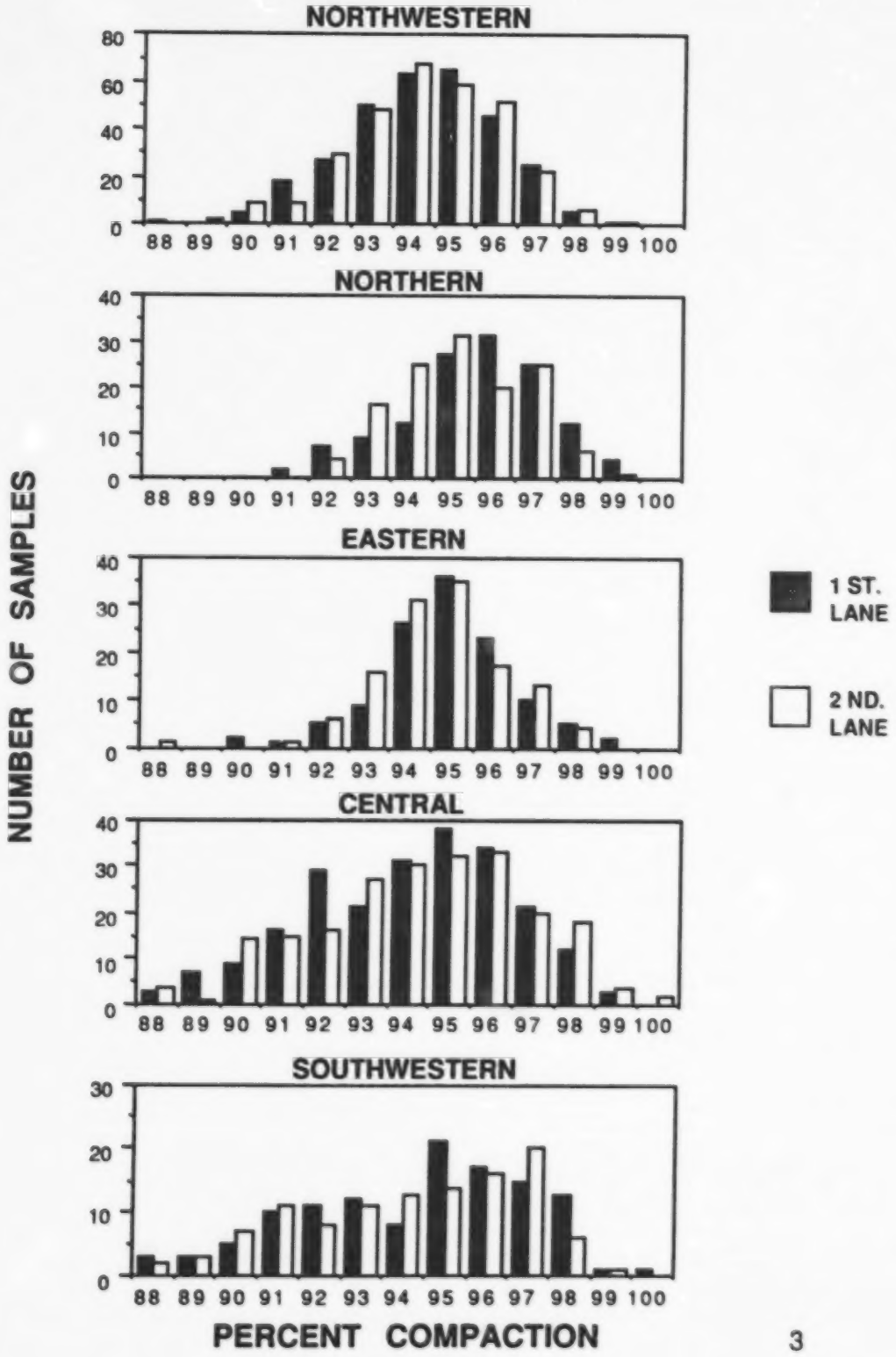


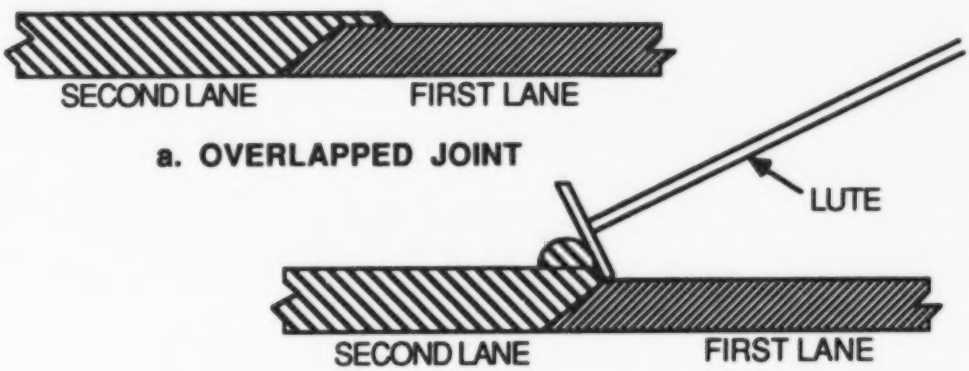
TABLE 2: JOINT COMPACTION BY MIX TYPE

REGION	NORTHWESTERN		NORTHERN		EASTERN		CENTRAL		SOUTHWESTERN	
MIX TYPE	1 ST. LANE	2 ND. LANE	1 ST. LANE	2 ND. LANE	1 ST. LANE	2 ND. LANE	1 ST. LANE	2 ND. LANE	1 ST. LANE	2 ND. LANE
DFC							92.2 (36)	91.6 (38)		
HL-1									92.8 (28)	92.9 (26)
HL-3							92.7 (06)	94.1 (6)		
HL-3 M					95.6 (13)	96.2 (12)				
HL-4			95.9 (104)	95.5 (106)	95.3 (85)	94.9 (81)			93.8 (42)	93.4 (38)
HL-4 HS						94.6 (09)				
HL-4 R									97.0 (50)	96.5 (48)
HL-8							94.5 (23)	94.9 (25)		
HL-8 HS							91.0 (10)	92.2 (10)		
HL-8 R							95.5 (123)	95.7 (125)		
RHM	94.7 (328)	94.7 (328)	96.6 (25)	96.4 (22)	95.6 (21)	95.8 (22)				

DISCUSSION

The fact that, on average, the joint compaction in the second lane paved is equal to that of the first, even though lateral support is present, suggests poor or incorrect construction practice. The most likely cause is one of starving the joint of material when placing the second mat. The second mat should be placed thicker than the existing compacted mat and overlap the existing mat by about 50 mm. The overlapping material should then be pushed back with a lute to create a hump directly over the joint. If this is not done, the roller will be supported by the existing mat and exert little compactive effort on the new mat next to the joint. Figure 3 demonstrates proper joint construction. Figure 4 shows two acceptable ways of compacting the joint with the breakdown roller. Figure 5 demonstrates the expected compaction curve that would be attained if proper construction techniques are performed.*

FIG. 3: PROPER JOINT CONSTRUCTION

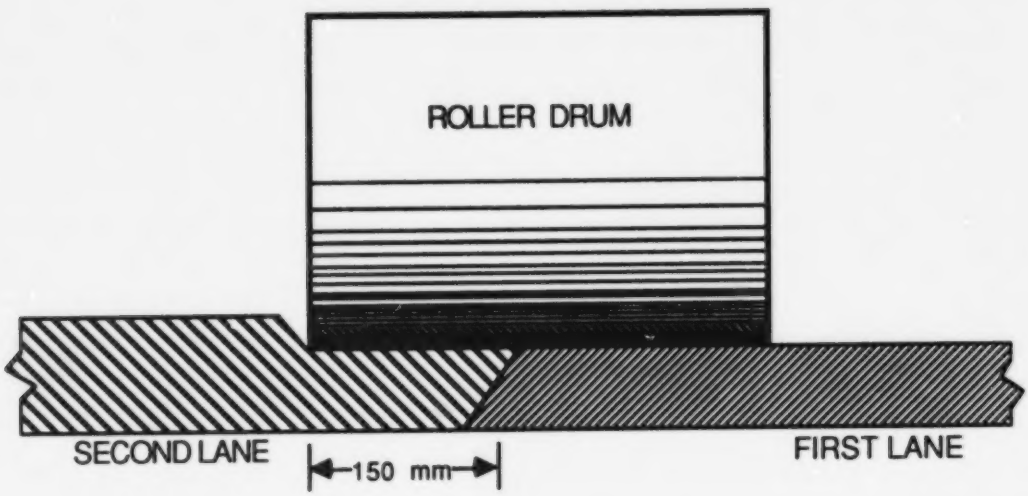


a. OVERLAPPED JOINT

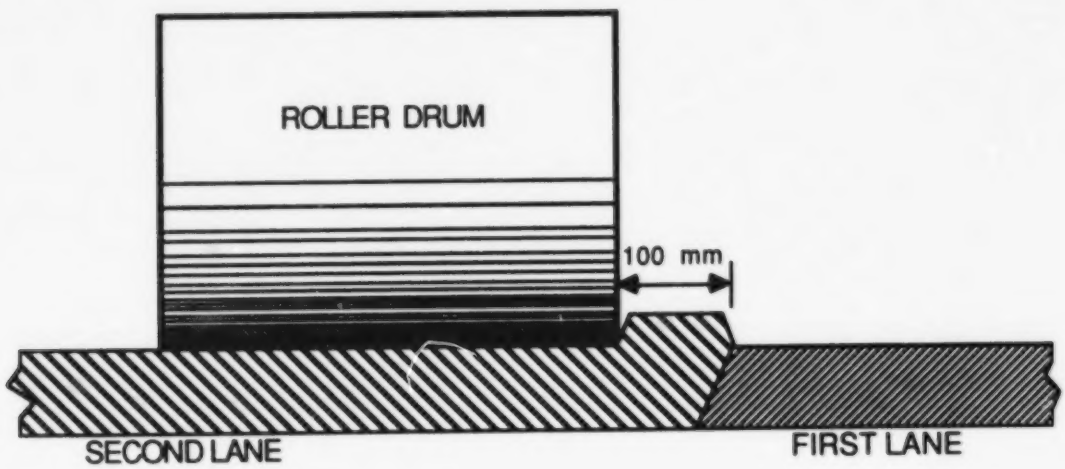
b. HUMPED JOINT

* Ref. National Asphalt Pavement Association publication QIP113/87

FIG. 4: ACCEPTABLE METHODS OF JOINT ROLLING

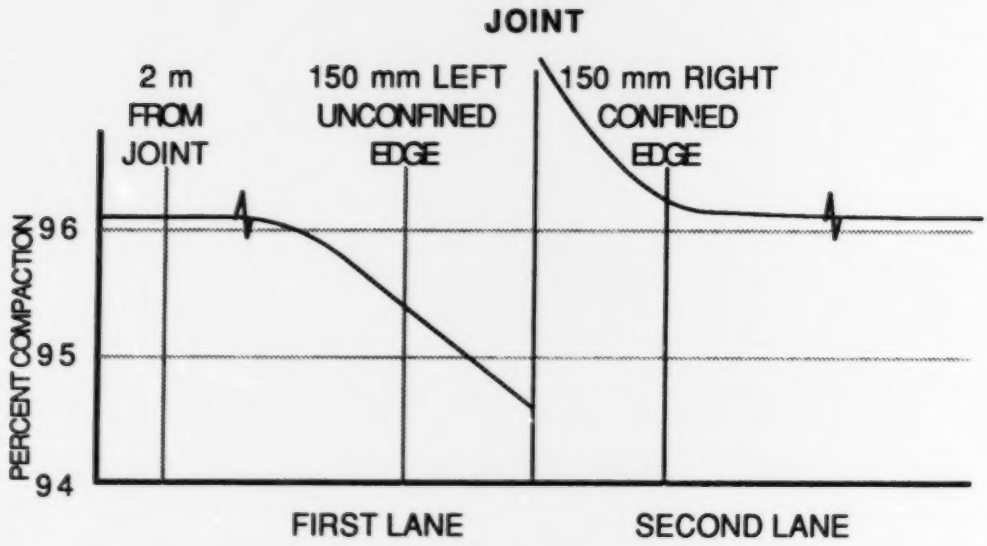


a. OVERLAPPED ROLLING



b. PINCHED ROLLING

FIG. 5: EXPECTED COMPACTION AT LONGITUDINAL JOINT (PROPER CONSTRUCTION)



RECOMMENDATIONS

1. Continue to monitor joint compaction through the 1988 construction season.

2. This report should be widely distributed to the Ministry construction staff for two reasons:
   a) to provide direct feedback to the person involved in generating the test data,
   b) to demonstrate the importance of good joint construction practices.